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(54) Character and image processing

(57) An image processing method comprises the steps of storing in a memory (4) image data derived by scanning (3) an original. Characters generated in a word processor (12) are arranged in a processor (15) so that character and image data occupy different areas of a reproduced composite image.

The image memory (4) may store one page of data and may be linked with a disc store (5) for storage of more pages of data. These may be printed serially on the same sheet.

Also disclosed is apparatus for re-feeding a printing sheet so that it is printed on both sides, and for controlling the position of the sheet to select the reproduced image position.

FIG. 2

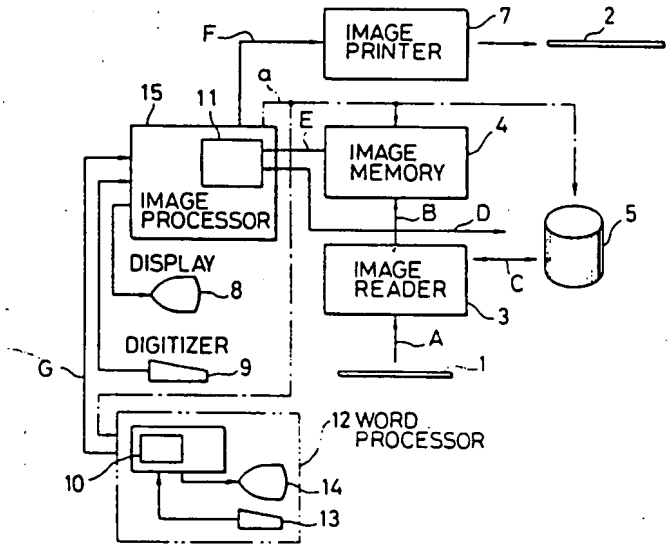

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FIG. 1

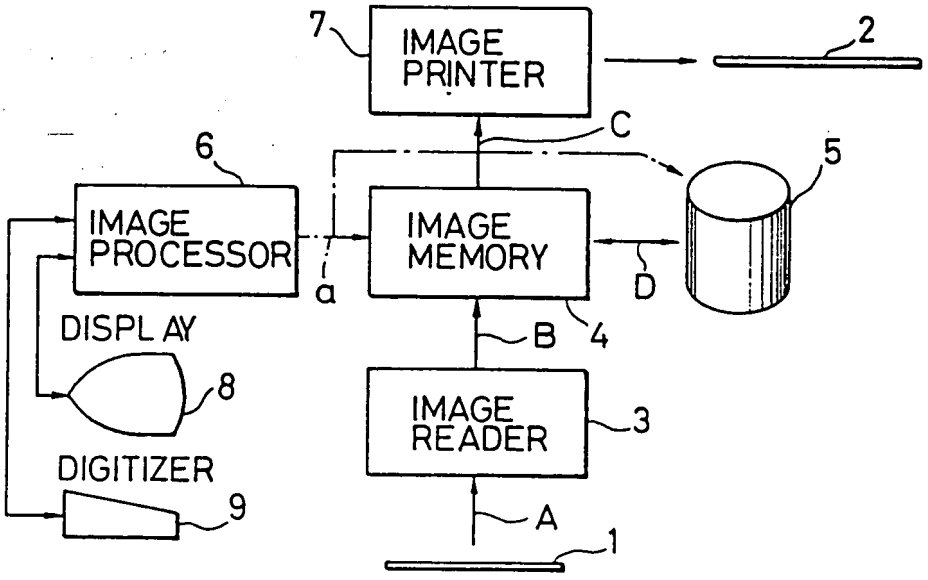

7
IMAGE PRINTER
2
C
6
5
IMAGE PROCESSOR
IMAGE MEMORY
a
D
DISPLAY
B
4
8
IMAGE READER
3
DIGITIZER
9
A
1

FIG. 2

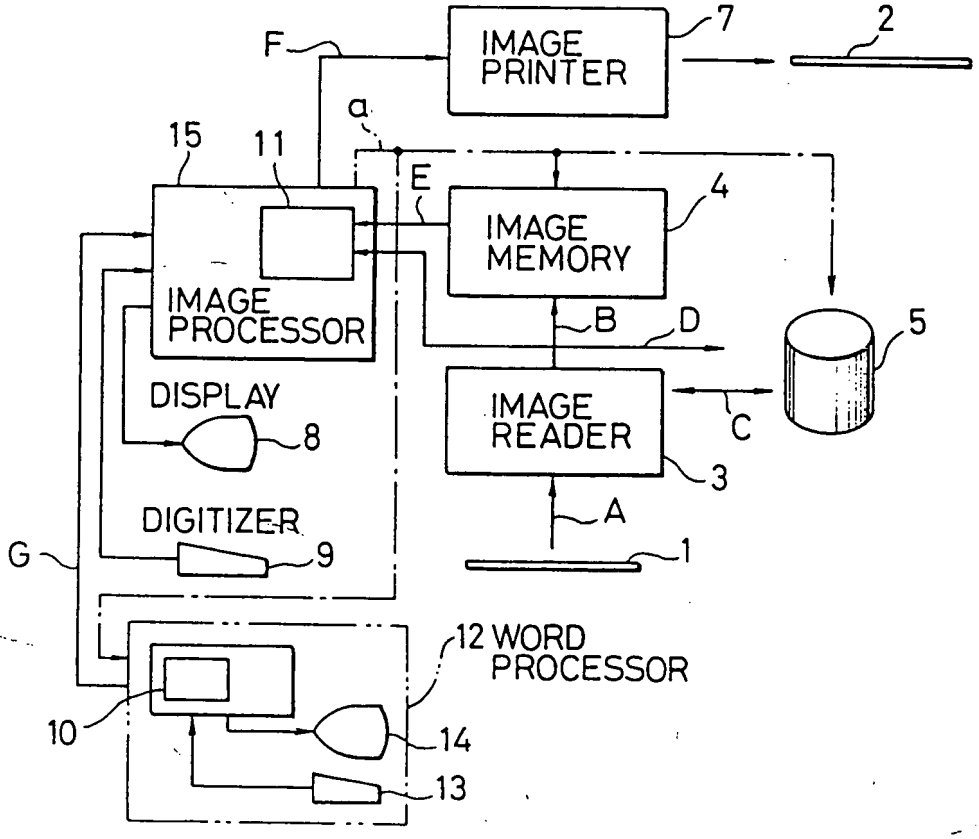

F
IMAGE PRINTER
7
2
a
15
11
E
4
IMAGE MEMORY
IMAGE PROCESSOR
B
D
5
DISPLAY
8
IMAGE READER
C
3
DIGITIZER
A
G
9
1
12 WORD PROCESSOR
10
14
13

FIG. 3A

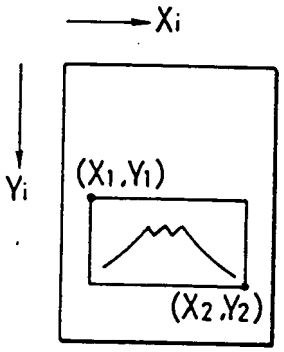


FIG. 3B

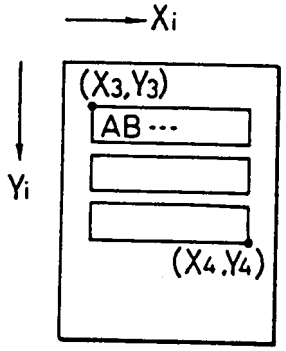


FIG. 3C

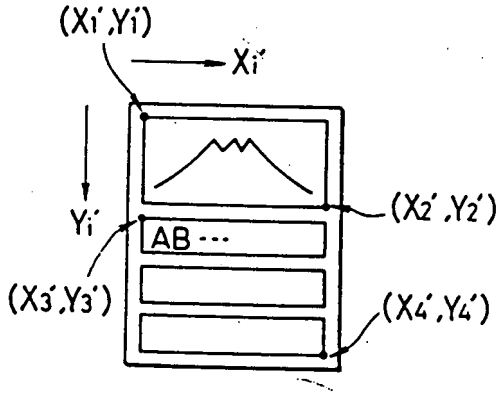


FIG. 4-1

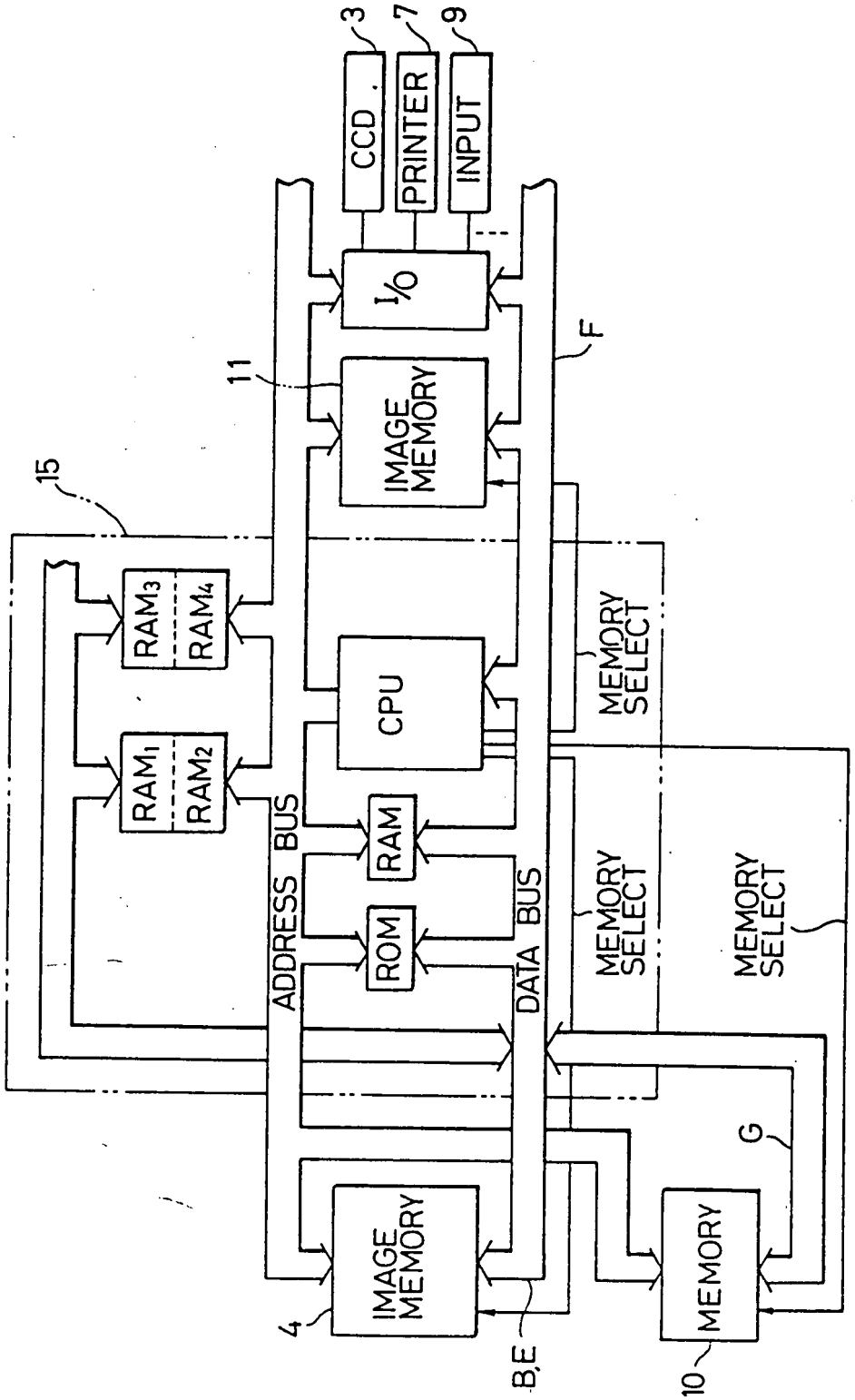

CCD
PRINTER
INPUT
3
7
9
I/O
IMAGE MEMORY
11
F
15
RAM3
RAM4
RAM1
RAM2
CPU
MEMORY SELECT
ADDRESS BUS
RAM
ROM
DATA BUS
MEMORY SELECT
MEMORY SELECT
IMAGE MEMORY
4
B,E
MEMORY
10
G

FIG. 4-2

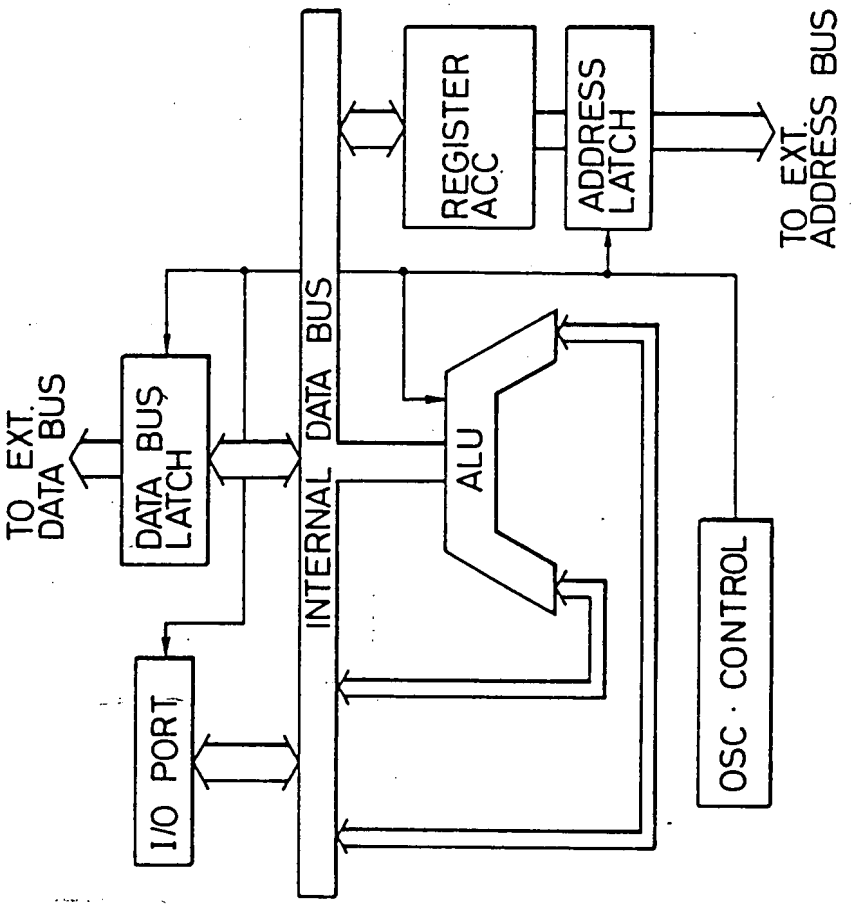

CPU
TO EXT. DATA BUS
DATA BUS LATCH
I/O PORT
INTERNAL DATA BUS
ALU
REGISTER ACC
ADDRESS LATCH
TO EXT. ADDRESS BUS
OSC · CONTROL

FIG. 5-1

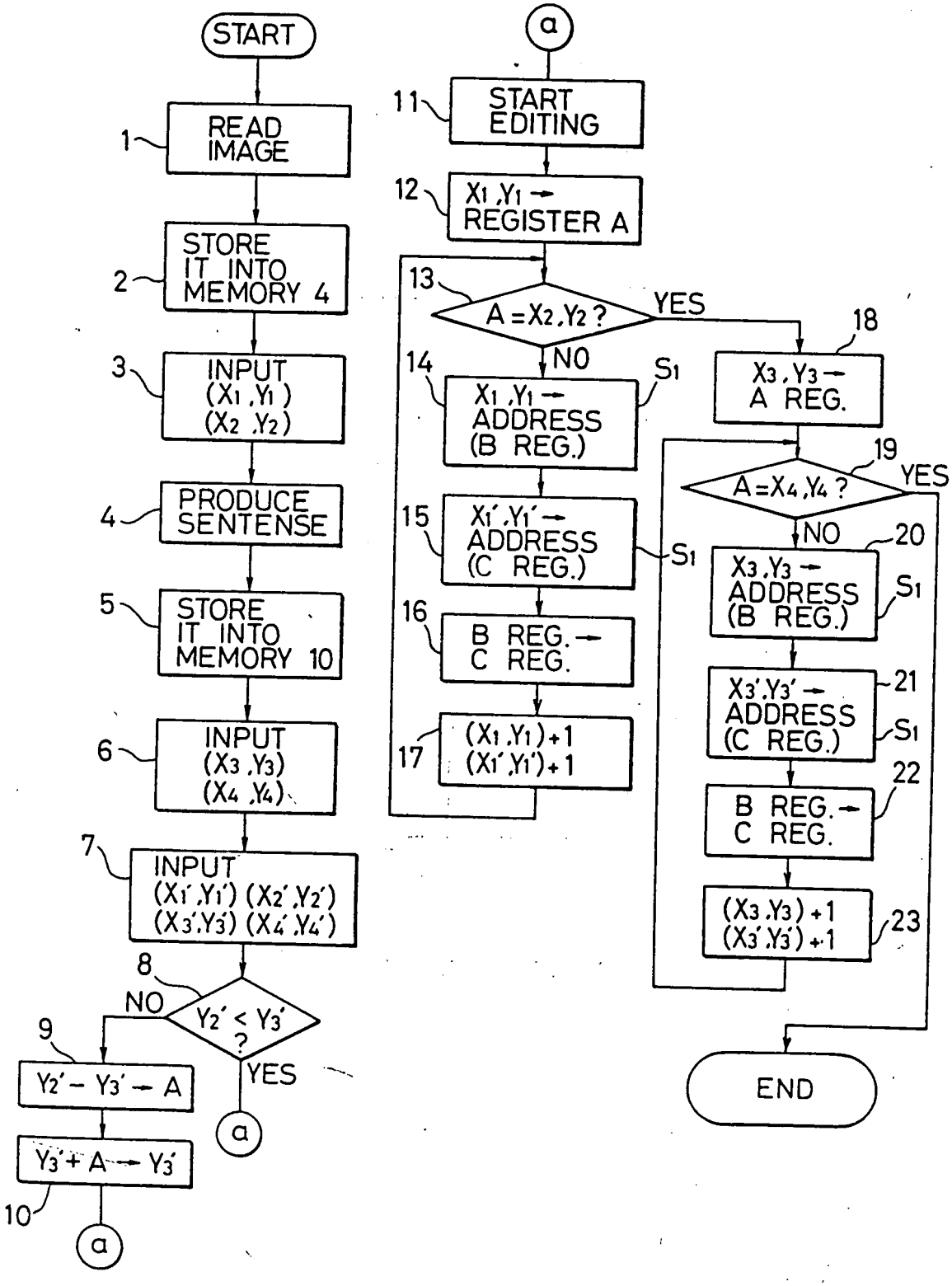

START
1 READ IMAGE
2 STORE IT INTO MEMORY 4
3 INPUT (X1 ,Y1) (X2 ,Y2)
4 PRODUCE SENTENSE
5 STORE IT INTO MEMORY 10
6 INPUT (X3 ,Y3) (X4 ,Y4)
7 INPUT (X1',Y1') (X2',Y2') (X3',Y3') (X4',Y4')
8 Y2' < Y3' ?
NO
YES
9 Y2' − Y3' → A
10 Y3' + A → Y3'
a
a
11 START EDITING
12 X1 ,Y1 → REGISTER A
13 A = X2 ,Y2 ?
YES
NO
14 X1 ,Y1 → ADDRESS (B REG.)
S1
15 X1',Y1' → ADDRESS (C REG.)
S1
16 B REG. → C REG.
17 (X1 ,Y1)+1 (X1',Y1')+1
18 X3 ,Y3 → A REG.
19 A = X4 ,Y4 ?
YES
NO
20 X3 ,Y3 → ADDRESS (B REG.)
S1
21 X3',Y3' → ADDRESS (C REG.)
S1
22 B REG. → C REG.
23 (X3 ,Y3) +1 (X3',Y3') +1
END

FIG. 5-2

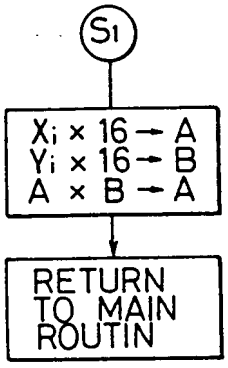


FIG. 5-3

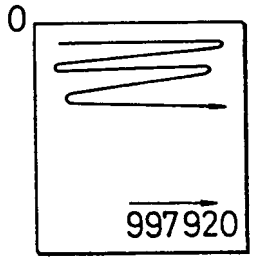


FIG. 6A

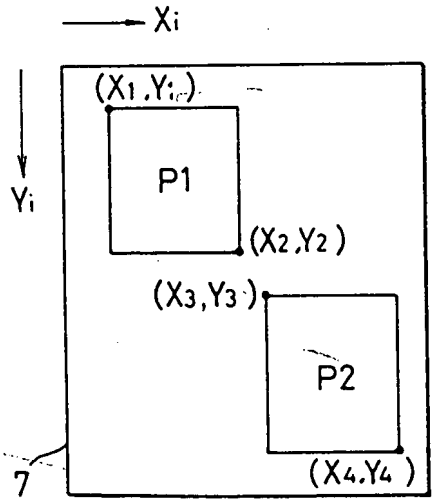


FIG. 6B

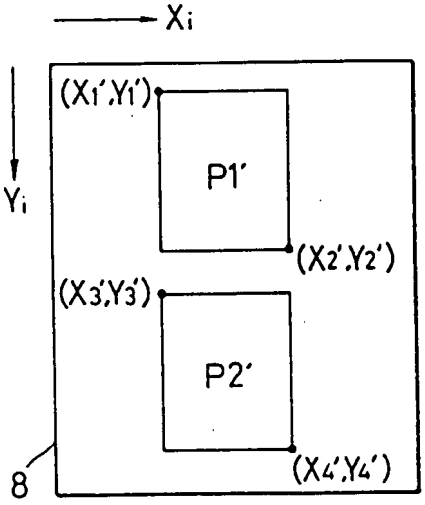


FIG. 7

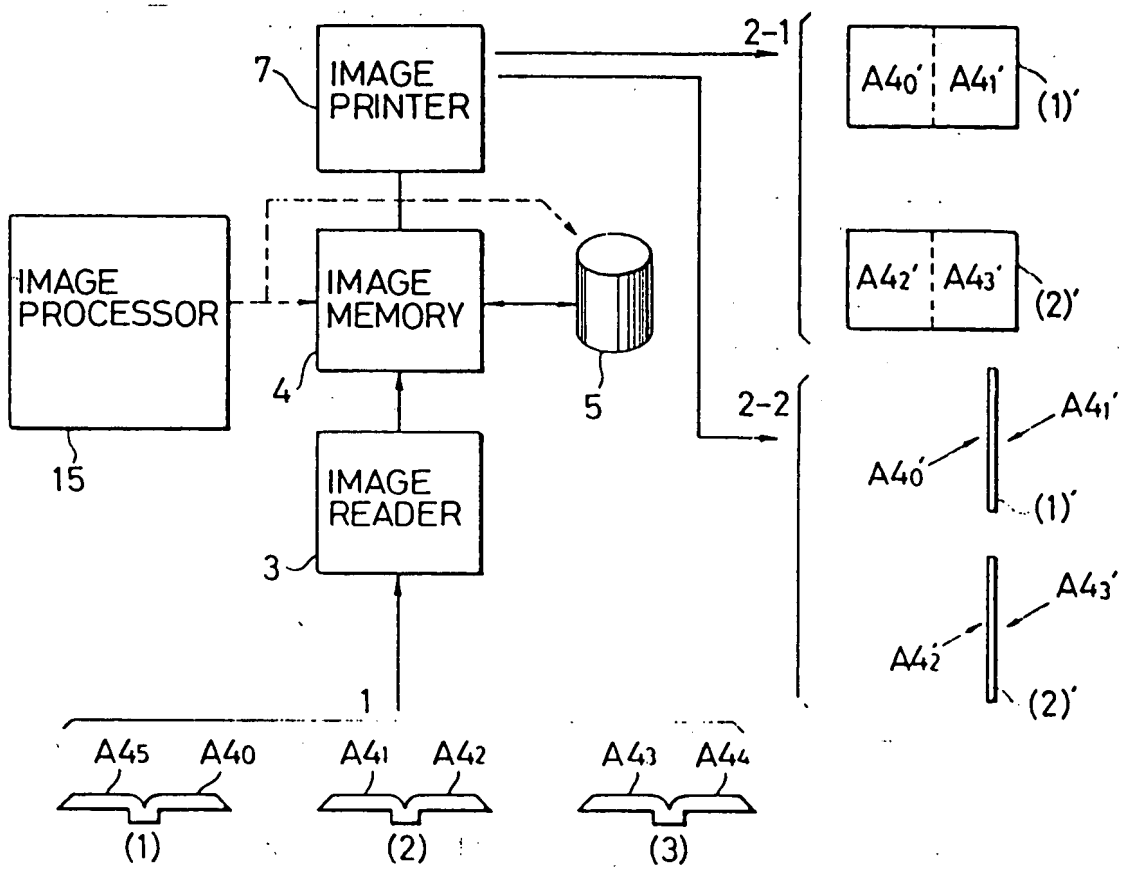


FIG. 8-1

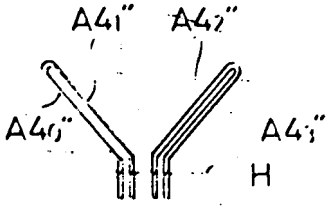


FIG. 8-2

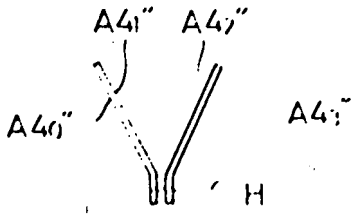


FIG. 9

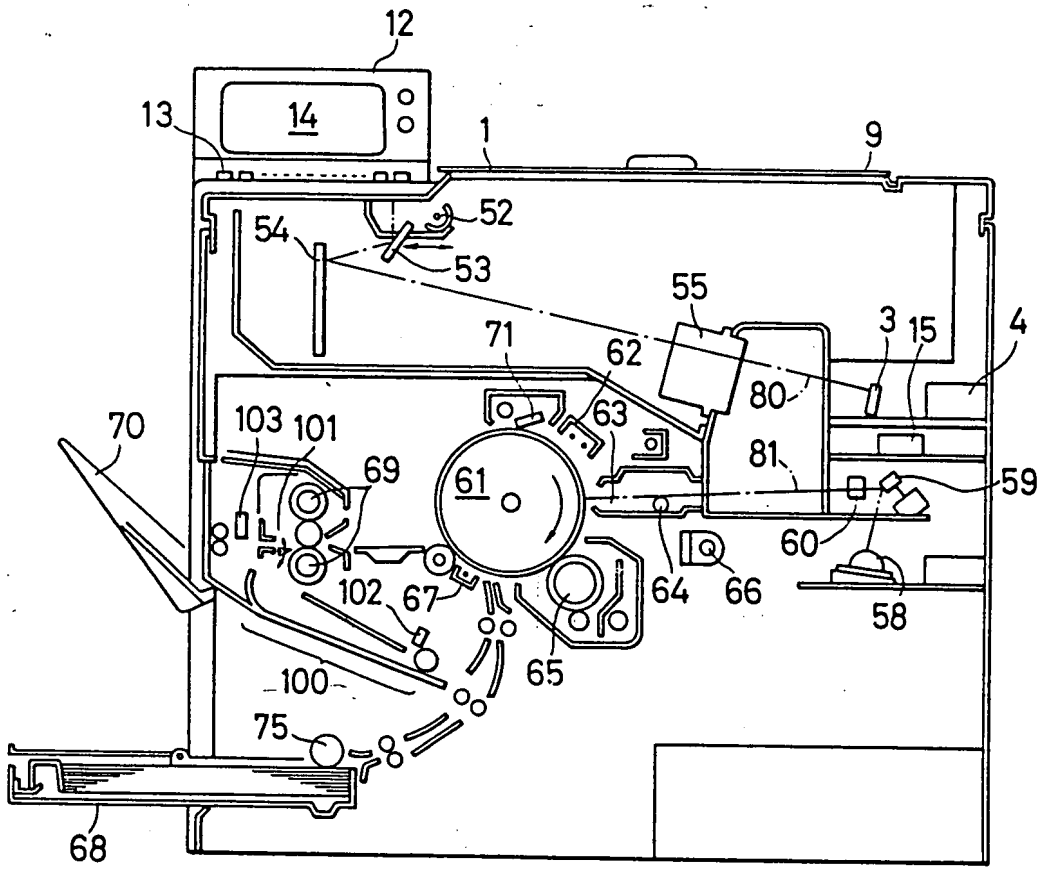
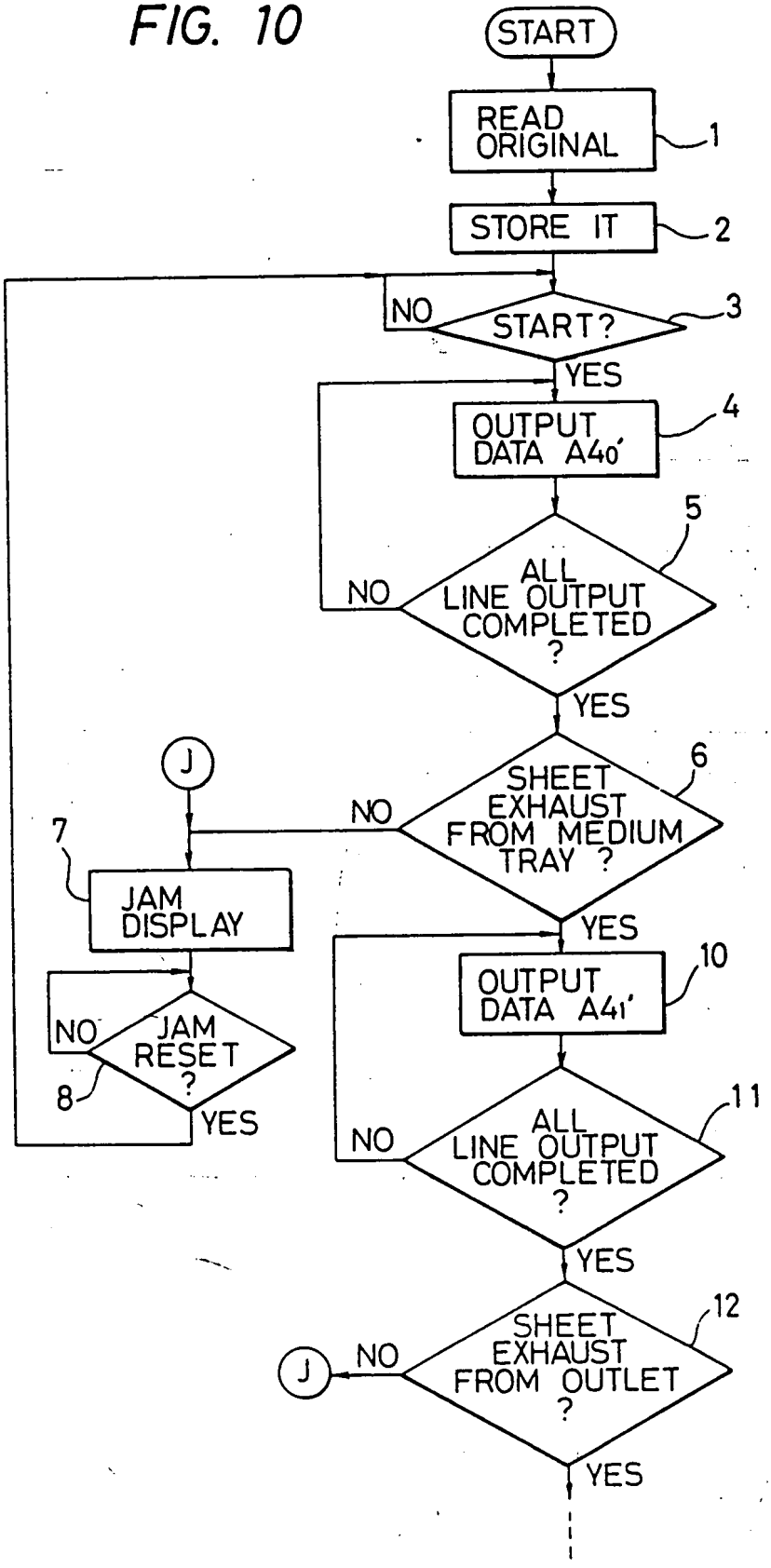

12
13
14
1
9
52
54
53
55
3
15
4
71
62
80
63
70
103
101
69
61
81
59
60
64
66
58
102
67
65
100
75
68

FIG. 10


START
READ ORIGINAL
1
STORE IT
2
NO
START?
3
YES
OUTPUT DATA A4o'
4
5
NO
ALL LINE OUTPUT COMPLETED ?
YES
J
6
NO
SHEET EXHAUST FROM MEDIUM TRAY ?
7
JAM DISPLAY
YES
10
OUTPUT DATA A4i'
NO
JAM RESET ?
8
YES
11
NO
ALL LINE OUTPUT COMPLETED ?
YES
12
J
NO
SHEET EXHAUST FROM OUTLET ?
YES

SPECIFICATION

Image processing method or apparatus

Background of the invention

Field of the invention

The present invention relates to an image data processing method or apparatus.

Description of the prior art

A typical example of an image processing apparatus according to the prior art is illustrated in Figure 1.

An original 1 is read by an image reader 3 and converted into digital signal. The digital signal of the original image is stored in an image memory 4. The image data are provisionally transferred into an external sub-memory such as disk 5 to form a data file for further processing the data for edition.

Processing for edition is carried out in an image processor 6. The image processor extracts a necessary portion of data from the data in the external sub-memory 5 and determines the arrangement of images finally required. After determining the image arrangement, the data are transferred into the image memory 4. The work necessary for image arrangement and confirmation of the determined arrangement is conducted by using an input-output apparatus of a display 8 and a wright pen 9. Data already processed and transferred into the image memory 4 are sent out to an image printer 7 where the processed image data are printed out as a record 2.

In the prior art apparatus of the type mentioned above, an image processed record can be obtained solely from the original image already read out by the image reader. It is difficult to add other image data afterwards. Although such addition of other data is not impossible, it involves a very complicated work for determining the layout in edition, in addition to the works for reading of document and input of said other image data to be added.

Another disadvantage of the above prior art apparatus is found in difficulty in putting a necessary correction. For example, if there is any miswritten word in the original document or any dirty letters are found in the read document or the layout of sentences determined by the image processing is made different from that of the original document, it is wished to put the necessary correction in the document portion. However, in the prior art apparatus, such correction is not allowable. Even if allowable, a very long time is required to make the corrections, which in turn reduces the efficiency of operation to great extent.

The use of sub-memory such as disk brings forth a drawback. The speed of data transfer in forward direction and backward direction is limited by the operation speed of such disk memory. No high speed processing is attainable. Furthermore, the use of external sub-assembly necessitates a time and labour consuming registration and reference.

Since, in the conventional apparatus, a plural number of document images are continuously copied, it is required to carry out the exchange of document in synchronism with the continuous copying operation. This makes the apparatus very complicated.

Summary of the invention

Accordingly, the present invention aims to provide an image processing method or apparatus which substantially alleviates the above disadvantages and drawbacks of the prior art.

In one aspect the invention aims to provide an improved image processing method or apparatus which enables to compound a document read image and a word input image.

In another aspect the invention aims to provide an image processing method or apparatus which enables to edit images with higher efficiency.

In a further aspect the invention aims to provide an image processing method or apparatus in which the position or area where one image data is reproduced never interferes the position or area for another image data.

In a still further aspect the invention aims to provide an image processing apparatus in which image data can be processed at high speed and therefore with an improved efficiency.

In another aspect the invention aims to provide a copying method or apparatus which enables to print images of a plural number of pages of document serially.

In a still further aspect the invention aims to provide a method or apparatus which enables to copy read images on both side surfaces of a sheet.

Other and further objects, features and advantages of the invention will appear more fully from the following description of preferred embodiments with reference to the accompanying drawings.

Brief description of the drawings

Figure 1 is a diagrammatic view of an image processing apparatus according to the prior art;

Figure 2 is a diagrammatic view of an image processing apparatus according to the invention showing an embodiment of the invention.

Figure 3 illustrates an example of image edition;

Figures 4-1 and *4-2* are detailed views of the control circuit in the apparatus shown in Figure 2;

Figures 5-1 and *5-3* are flow charts of the control;

Figure 5-3 is an illustration of coordinate-address conversion;

Figures 6A and *6B* show another example of image edition;

Figure 7 shows a further example of image edition;

Figures 8-1 and *8-2* show a copy obtained therefrom;

Figure 9 is a sectional view of a copying machine to which the present invention is applicable; and

Figure 10 is a flow chart of the control for the example shown in Figure 7.

Description of the preferred embodiments

Referring to Figure 2 showing an embodiment of the present invention, reference numeral 1 designates an original which may be, for example, a photo picture of Figure 3 is an image reader for reading the original 1 and converting the read images into digital

signals. The image reader 3 comprises a known line scanner such as CCD and a driving apparatus for moving the scanner in the secondary scan direction. Image data read by the image reader 3 are stored in an image memory 4. The image memory 4 comprises a known semiconductor page memory having a capacity enough to store one page amount of image data. 5 is an external sub-memory for storing a large amount of data from the image memory 4 as a data file. The external sub-memory 5 comprises a known magneto disk and means for access to it. 12 is a known word processor for producing a sentence. The word processor 12 contains a keyboard 13, a display 14 and a sentence memory 10. The sentence memory 10 comprises a known semiconductor memory having a capacity enough to store such amount of data corresponding to one page of print. 15 is an image processor for compounding and editing data from the image memory 4, external sub-memory 5 and word processor 12. The image processor also performs editing of sentence data from the word processor 12 for starting new paragraph at the same time. The image processor 15 contains an edited data memory 11 comprising a known semiconductor memory. The content of the edited data memory 11 corresponds to the final print image then desired. 7 is an image printer ~~for printing~~ for printing out the data processed by the image processor. The image printer is a known laser printer. 2 designates a record having images edited. A, B, C, D, E, F and G designate data buses for image and sentence. The data bus G is also useful for data communication through a communication circuit. *a* designates a control signal line for controlling every part in selection of the part etc. Other parts of the apparatus correspond to those of the apparatus shown in Figure 2 and need not be further described.

Figure 3 illustrates the manner of image edition employing the embodiment shown in Figure 2.

Figure 3A shows an original image such as a photo picture or a figure to be read by the image reader 3. Xi and Yi indicate the position and area of the original image. Figure 3B shows a sentence made by the word processor 12. The sentence thus made is stored in the sentence memory 10. Figure 3C shows an example of the layout of image and sentence as required after image edition. The manner of operation of the apparatus for this example is as follows:

The image reader 3 shown in Figure 2 reads the original picture image shown in Figure 3A. The image memory 4 stores the image data. Image area and its position, Xi and Yi corresponding to (X1, Y1)(X2, Y2) of the image memory. White and black of the image part are stored as "0" and "1", respectively. If the image has to be stored for a long time, then it is transferred into the external sub-memory 5 to keep it in memory as a data file.

The sentence data shown in Figure 3B is such data made up by the word processor 12. A sentence clear in meaning is an example of such sentence data. The data is put in by the keyboard 13 as character code. After being made up to a complete sentence, the data is stored at (X3, Y3), (X4, Y4) in the sentence memory 10 shown in Figure 2.

The image processor 9 in Figure 2 converts Xi and Yi indicating the image position and area into the coordinates of (X'1, Y'1), (X'2, Y'2) and then determines the coordinates of the sentence insertion area (X'3, Y'3), (X'4, Y'4) to obtain the final image arranged as shown in Figure 3C. This processing is carried out in the following procedure.

As previously described, the image processor 15 contains an edited data memory designated by 11. The converted coordinate positions are allocated to the corresponding positions of the memory 11 so that the positions for arrangement of the image data and the sentence data are determined. The image processor 15 dispatches a processing instruction signal *a* to transfer the image data existing between the areas (X1, Y1) and (X2, Y2) from the image memory 4 or the external sub-memory 5 into the area (X'1, Y'1)(X'2, Y'2) in the edited data memory 11 through the data bus E.

As for the sentence data, the image processor 15 calculates and evaluates the number of characters existing in the insertion area in the edited data memory 11 defined by (X'3, Y'3) and (X'4, Y'4). Then, it indicates the number of characters which can be transferred up to the point (X'4, Y'4). This prevents any character image from entering the area of read image. Thereafter, the image processor 15 transfers data to the above defined area in the memory 11 from the sentence memory 10 in the word processor 12 through data bus G while starting new line without changing the number of characters in one line by the new line starting function of the image processor 15. In this manner, the position for reproducing the read image can be determined with first priority. Also, it is made possible to edit the character image in an area other than the area used for editing the read image.

After the above processing and editing, the edited data memory 11 has the corresponding image data and sentence data at the determined positions and in the determined areas corresponding to X'i and Y'i. This content of the memory 11 is transferred to the image printer 7 through the data bus F. Thus, an image edited record 2 can to obtained.

The above embodiment will be described further in detail hereinafter with reference to Figures 4 and 5.

In Figure 4-1 showing the details of the apparatus shown in Figure 2, the image processor 15 is constituted of CPU, ROM, RAM etc. which may be, for example, of a known microcomputer. ROM has a program as shown in Figure 5 stored therein. By executing the program, the above described process of processing image data is controlled. Data buses shown in Figure 4-1 correspond to those designated by A-G in Figure 2. The address buses are lines for setting addresses of the respective memories and the like. The coordinate input apparatus 9 is used to set position for image processing. The input apparatus 9 is a known digitizer or keyboard. Other input apparatus also may be used as the coordinate input apparatus 9 so long as it is able to indicate points on a coordinates. For example, a write pen or a cursor on Braun tube may be used.

RAM1 is an image area memory for storing data (X1, Y1) (X2, Y2) indicative of the position and area

of the read image in the memory 4. RAM2 is a memory for storing data (X'1, Y'1) (X'2, Y'2) indicative of the position and area for reproduction of said read image. RAM3 is a memory for storing data (X3, Y3)(X4, Y4) indicative of the position and area of the sentence image in the memory 10. RAM4 is a memory for storing data (X'3, Y'3)(X'4, Y'4) indicative of the position and area for reproduction of said sentence image. Data of RAM4 is determined depending on the data of RAM2. But, it is also possible to determine the data in RAM4 by the input apparatus 9. Data of RAM1, RAM2 and RAM3 can be determined by the input apparatus 9. Memories 4, 10 and 11 are refresh type DRAM (dynamic RAM).

Figure 4-2 shows a concrete example of CPU shown in Figure 4-1. The concrete example is the structure of HMCS 68000 supplied by Moto Roller or Hitachi. The structure is described in detail in its manual and therefore need not be described herein.

The manner of operation of the above shown apparatus will be described hereinafter with reference to the flow chart shown in Figure 5. The flow described hereinunder is the program stored in ROM in Figure 4-1.

The image reader reads an original document (1) and the read image is stored in the image memory 4 as image data (2). On the other hand, the position data of the necessary image portion (X1, Y1)(X2, Y2) are introduced into the apparatus by the coordinate input apparatus 9 (3). To make the position data correspond to the original, the input of position data may be carried out by placing the original on a digitizer and plotting the apexes of the desired area. The position data is provisionally stored in the image position information area data memory RAM1 within the memory RAM of the image processor 15 shown in Figure 4-1. If the input of position data is carried out using not a digitizer but a keyboard, then the position Xi, Yi may be set also by previously making a correspondency between actual size and key input value. The input of position data can be carried out before or after reading the original image. When a standardized image is read or when an image in the same position is read many times repeatedly, such image may be stored and fixed in ROM.

The image memory 4 is constituted of a semiconductor memory using a dynamic RAM. To store all of the sizes in A4 format as digital values, the image memory 4 has a capacity of 210 × 297 × 16 = 997920 bits provided that it has a resolving power of 16 pel/mm bit density for 210 mm (length) × 297mm (width). To set Xi, Yi position of the original 1 from among the memory, CPU carries out address setting of the image memory (area coordinate → address conversion). Reading and writing of the image are conducted by the address. The correspondency between memory address and position Xi, Yi is obtained by computing the memory address corresponding to the previously plotted Xi, Yi within CPU. Let Xi be 210mm in length. Then, the width of address data value to be set will be 0 - 3360 bit. Similarly, when Yi is 297mm in width, the width of address data value if 0 - 4752 bit. CPU issues therefore address value up to 997920 to set the address for the combination of Xi and Yi. The address conversion and image data transferring described above are executed at steps after step 11. While, in this example, the position of the original has been stored in data RAM in terms of Xi, Yi, it is also possible to use means for converting the size indicated by a digitizer into an image memory address and make the memory address stored in the data RAM keeping the correspondency between size and address. Furthermore, it is also possible to issue the address of Xi, Yi from CPU and convert it into memory address on the side of the image memory. To this end, Xi, Yi address is previously put in through an address setting line of ROM by the address conversion circuit of ROM and an image memory address corresponding to the address input is previously given as ROM data.

At the next step 4, the word processor 12 produces a sentence which is to be compounded with the read image (4). This is done by keyboard input. The arrangement of characters in the sentence is automatically determined in such manner as to allot an area other than the area of the read image to the sentence and suitably start new line. Therefore, man need not worry about the form of the sentence. If it is a standardized sentence, then the sentence may be advantageously stored in ROM or in a disk device to use it whenever necessary. There is no need of worrying about the arrangement irrespective of what image is to be compounded with the sentence. This is a particular advantage of the present apparatus.

The input character codes are converted into picture element data by a character generator within the word processor 12 and then transferred into the sentence memory 10 (5). The sentence memory 10 is of the same structure as the image memory 4 and is connected to CPU. However, since the sentence character does not require so high revolving power as the image does, the sentence memory may be formed with a lower memory capacity than the image memory. To expand the produced sentence to determined positions as data, the position data of (X3, Y3)(X4, Y4) are put in by the coordinate input apparatus 9 (6). RAM3 of the sentence area RAM shown in Figure 4-1 stores the input position data as area data. The coordinate data of (X3, Y3)(X4, Y4) may be, of course, introduced even before the production of the sentence to expand the character data to the memory addresses corresponding to the set positions of the sentence memory during the production of the sentence. However, since the word processor naturally contains an indirect buffer memory therein to assure an easy production of sentence, it is the best way to carry out the input of the coordinate data after producing the sentence.

At the step 5 subsequent to the production of the sentence, the input of the position data (X'1, Y'1)(X'2, Y'2), (X'3, Y'3)(X'4, Y'4) for arranging the image and the sentence is executed. The image position data is stored in RAM2 of the image data area RAM and the sentence position data is stored in RAM4 of the sentence area RAM. To prevent the image data and the sentence data from overlapping each other on this position setting, CPU computes the area data of RAM2 and RAM4 to perform an

automatic alteration of sentence position (8), (9). To this end, Y'2 of the converted position data of the read image in RAM2 is compared with Y'3 of the character image (8). Only when Y'3 is larger than Y'2, that is, the character image position lines out of the area of the read image, the step is directly advanced to the step of transferring image data. If it is desired that Y'3 is smaller than Y'2, that is, the character image position lies within the area of the read image, then Y'3 is subtracted from Y'2 and the amount of line corresponding to the difference is registered in a register A. Further, the data of A is added to Y'3 so as to make a new line start with line shift-down by A.

After completing the above step, CPU converts (X'1, Y'1) of RAM2 into address and indicates the address to the edited data memory 11 to instruct the start point of image data writing. Then, image data value at the position indicated as the address of (X1, Y1) in RAM1 is transferred from the image memory 4 to the edited data memory 11 at the indicated start point. This operation is repeated up to the address of (X2, Y2) to perform the necessary image extraction and position alteration. In this manner, only the image part is transferred into the edited data memory 11 (11 - 17). More particularly, these steps are carried out in the following procedure:

At first, data of (X1, Y1) in RAM1 is transmitted to the register A of CPU (12). A discrimination is made as to whether or not the content of the register A is equal to (X2, Y2) (13). When it is not, the content of the register A is converted into address data and transferred to a register B according to the method illustrated in Figure 5-2 (14). Data of (X'1, Y'1) in RAM2 is also converted into address data and transferred into a register C (15). Then, the image data indicated by the register B is transferred into the address of memory 11 indicated by the register C (16). 1 is added to X1, X'1 and also upon the end of one line address conversion 1 is added to Y1, Y'1 (17). These data (X1, Y1) + 1, (X'1, Y'1) + 1 are transferred into the register A and a discrimination is made as to whether or not the content of the register A reaches X2, Y2 (13). If not, the above procedure is repeated until it reaches X2, Y2. When it reaches X2, Y2, CPU carries out address conversion of (X3, Y3) at RAM4 similarly to the above and indicates the address to the edited data memory 11 as the starting point of sentence data writing. Data RAM3 takes up the sentence data value at (X3, Y3) address from the sentence memory 4 and transfers it into the edited data memory 11 at the indicated starting point. This operation is repeated up to the address of (X4, Y4) and only the sentence part is transferred into the data memory while carrying out the necessary alteration of the sentence position (18 - 23). The conversion routine shown in Figure 5-2 is carried out starting from the top on the left side of the memory as (Xi, Yi) → 0 and along the arrow keeping the correspondence to address as shown in Figure 5-3.

The respective memory outputs are compounded by OR logic and put into the edited data memory 11. Therefore, the content of the memory appears as that shown in Figure 3C. In this manner, a composition of image and sentence is attained. To prevent any overlap of memory addresses, selection of memory is made by changeover of the select terminal by select lines. Before starting the operation (at the program start step), all of the data in the edited data memory 11 are cleared. Therefore, there remains only background data (for example, 0) for the area other than the image and sentence portions as defined by Figure 3C. Thus, there can be formed white or black background part by the background data.

Obviously many modifications and variations of the above embodiment are possible in the light of the above teachings.

In the above example, data area of the image and sentence before and after alteration of position have been determined by setting position only. However, it is also possible to determine the data area by suitably setting the first point and the amount of data. Also, in the above example, the data area before alteration of position and that after alteration of position have been the same. However, it is also possible to change the data area. While the position of character image has been automatically determined by indicating the final arrangement of the read image, it is also possible to automatically determine the position of the read image by indicating the position of the sentence. Further, even when an sentence is arranged between two image parts, the position of the sentence in such arrangement can be determined automatically by computing operation of CPU. In this case, data of RAM4 in the sentence area RAM are so made as not to interfere with the read image. To this end, CPU subtracts the size in Xi-direction of the image part from the full width in Xi-direction and at the same time calculates the remaining width of the sentence part to make new line start at the most suitable point.

As readily understood from the foregoing, the present invention enables to compound image data and character data. Since there is used a word processor to make sentence data and the sentence data exist as character codes of the respective characters constituting the sentence (for example, JIS key cord etc.), rearrangement of sentence, insertion of word, correction of wrong word, line shift etc. can be carried out at will. This makes it possible to arrange the sentence in the area other than the area for the image part with a higher efficiency when editing a combination of image data and character data. It enables also to easily arrange the sentence in a place easy to see. Further it has another advantage that a communication circuit can be used as data transmission line for data from the word processor. Therefore, image processing can be carried out using sentence data from a word processor at a remote place.

In the above description with reference to Figure 2 embodiment, the external sub-memory 5 has been shown and described as a memory used only for image data. However, it will be obvious that the external sub-memory may be used for storing character data when a large amount of character data are transferred from the word processor all at once. In this case, the image processor processes the data as character code correction of character and

rearrangement of sentence can be carried out in the same manner as above because the external sub-memory can store the data as character code data. Therefore, this constitutes another embodiment of the invention.

Hereinafter, description will be made of an example in which two portions of the same original image are changed in arrangement and then printed. This example is described with reference to Figures 6A and 6B.

Figure 6A shows an original to be processed. P1 and P2 are two different portions of the original. Figure 6B shows a design of rearrangement to be obtained by image processing the original shown in Figure 6A. P1' and P2' correspond to P1 and P2. But, the arrangement of P1' and P2' is different from that of P1 and P2. In this example, therefore, it is wished to shift the image portion P1 to P1' and P2 to P2'.

Image area of the portion P1 is defined by (X1, Y1) and (X2, Y2) with the left and upper apex being taken as a point of origin. Similarly, image area of P2 is defined by (X3, Y3) and (X4, Y4). In Figure 6B, image area of P1' after rearrangement is defined by (X'1, Y'1)(X'2, Y'2) and that of P2' by (X'3, Y'3)(X'4, Y'4). The image is printed in the position shown in Figure 6B.

The image reader 3 previously described reads the original to be image processed and puts out image signals in the form of digital signal into the data bus B.

The image memory 4 (first image memory) receives the signals and stores the read image data as "0" for white portion and as "1" for black portion in accordance with the image positions of the original.

The image processor 15 carries out coordinate-address conversion for all or a desired portion of the image detail in the memory 4. The address converted data are transferred into the memory (second memory) 11 which stores the data. Image area stored in the first memory and image area stored in the second memory are shown in Figures 6A and 6B respectively. As the first and second memories 4 and 11 there are used semiconductor memory RAM. Therefore, data transfer can be carried out at a high speed. In particular, by employing DMA system of CPU a high speed data transfer can be carried directly from the data bus E.

Since the image shown in Figure 6A is that stored in the first image memory 4 shown in Figure 2, the image data in the memory 4 correspond to the image portions P1 and P2 enclosed by the corresponding position coordinates in Figure 6A. Similarly, the image data in the second memory 11 correspond to the image portions P1' and P2' in Figure 6B.

The position coordinates data Xi, Yi of these P1, P2, P1' and P2' are read by display 10, digitizer 9 and image processor 15 and stored in RAM1 - RAM4 shown in Figure 2 in the procedure shown in Figure 5. In the case of this example, the control flow can be realized by omitting steps 4 - 6 in Figure 5-1 and adding the steps of input discrimination of (X3, Y3) (X4, Y4) and RAM setting to step 4. Following the above steps, coordinate-address conversion and image data transfer are carried out in the same manner as described above so that the images P1, P2 in the first memory are transferred into the second memory 11 as images P1' and P2'. A copy as shown in Figure 6B is obtained by sequentially putting out the image data from the memory 11 to the printer 7.

As described above, when there are used two image memories, namely a first image memory for storing, at high speed, the read image data of an original to be processed and a second image memory for spreading the processed image data, rearrangement, deletion and addition of image can be carried out without the aid of any external memory. Therefore, a further improvement of data transfer speed and processing efficiency can be attained.

As another embodiment, two image memories can be used together with an external memory 5 in Figure 1. In this embodiment, data are extracted from the external sub-memory 5 while making a reference to the image data in the first image memory 1 and the image data are spread in the second image memory 2. In this manner, the use of two image memories makes it possible to perform reference image processing and further improve the efficiency of image edition.

The capacity of image memory is never limited to that of two pages only. The image memory can be provided with a higher capacity more than two pages.

According to the method of the present invention, a plural number of images can be printed serially. An example of such printing is described hereinafter with reference to Figure 7 and 8.

In Figure 7, books (1), (2) and (3) are laid on a table with their pages $A4_0$ - $A4_5$ open. The image reader 3 reads these pages of books (1), (2) and (3). The read original images are transferred into the image memory 4 which is able to store two pages in A4 format of amount of data at once as A3 format size. The external sub-memory 7 stores the read original for a long time as data file in one page unit. From the external sub-memory, data can be extracted in page unit whenever necessary. The image processor 15 can process the necessary two page images for composition. It compounds data of one page in the external sub-memory 5 and data in the image memory 4 or compounds data of two pages in the external sub-memory 5, and then puts out the compound images serially. The image printer 7 sends out the composition-processed content of the image memory 4 serially to record it on a paper of A3 format. 2-(1)' and (2)' are records thus obtained. The record 2-(1)' is a recording paper of A3 format having images of ($A4_0'$, $A4_1'$) and the record 2-(2)' is that having images of ($A4_2'$, $A4_3'$). $A4_0'$ means a copy of the page $A4_0$ of the book 1-(1). The same applies to other similar symbols.

At first, pages $A4_0$ and $A4_5$ of book 1-(1) are read by the image reader 3. The read original is transferred into the image memory 4 as image signals. $A4_0$ and $A4_5$ are registered at the areas M_1 and M_2 of the image memory 4. The content of image memory 4 is transferred into the external sub-memory 5 after a file number being affixed to every page by the image processor 15.

The above operation is repeated also for book 1-(2) and 1-(3) to form a data file of the book 1 in the external sub-memory 5. After completing the repeating operation, the image processor 15 transfers the first stored data of page $A4_0$ from the external sub-memory 5 to the image memory 4 at its area M1. Similarly, the next data of page $A4_5$ is transferred to the next area M2 of the image memory 4. The data in the image memory 4 are serially sent out to the image printer 7 so that a record as shown in 2-(1)' is obtained. In the same manner, pages $A4_2$ and $A4_3$ are copied to form a record 2-(2)'.

As seen in Figure 7, the record of 2-(1)' having $A4_0$' and $A4_1$' and the record of 2-(2)' having $A4_2$' and $A4_3$' are contained each in one paper sheet of A3 format.

The copied originals are folded back along the center line of each the sheet with each page upward and bound at H as shown in Figure 8-1.

When the bound records are opened wide, $A4_1$" is on the left-hand side and $A4_2$" is on the right-hand side, which is entirely the same as the original 1-(2) (Figure 8-2).

According to the above embodiment, original images can be copied maintaining the same arrangement of pages as in the original book and with good efficiency. Thus, a copy easy to see can be provided.

In addition, it is possible to correct any misarrangement of pages in the original or insert any relevant page extracted from the file.

The process control necessary for obtaining the above mentioned copies can be carried out according to the flow chart shown in Figure 10 (later described) with the exception that the steps 6 and 9 are replaced by a time delay step for providing a marginal to fold back on the copy sheet. More particularly, data of $A4_0$' are put out from the memory 4 (4) and a discrimination is made as to whether or not all line output in one page amount of $A4_0$' is completed (5). If not, the output is repeated until all line output is completed. This discrimination can be performed by line counting 210mm × 16 pel/mm by the image processor 15 and detecting the end of count. Upon completion of one page amount of output, a predetermined blank time is given and thereafter data output from the memory 4 is carried out (10, 11). Thus, a copy of two pages can be obtained on one copy sheet of A3 format with a margin to fold back between the images $A4_0$' and $A4_1$'.

The method of the present invention is applicable also to such case wherein image is formed on both sides of one copy sheet.

Before entering the description of an example of such both side copying, we will describe an example of copying machine provided with an image printer 7 which is applicable to all of the above examples.

In Figure 9, there is shown such an example of copying machine. An original laid on a platen 1 is illuminated by a lamp 52 and scanned by mirrors 53 and 54 moving in the direction of arrow. 80 designates a reflected image formed by the slit scan. The reflected image 80 forms an image on the photoreceptor part of CCD 3 through a lens 55. The image is converted into an electrical signal every slit line by self scan of CCD and stores in a memory 4 through a buffer in the manner described above. In response to an output start signal, data are read out from the memory 4. Through a buffer the read data modulates a beam 81 from a laser oscillator 58. The beam is deflected upon a polygon mirror 59 to beam scan a rotating photosensitive drum 61. Thus, as electrostatic latent image is formed on the drum. The electrostatic latent image on the drum is developed by a developing device 65 and the developed image is transferred onto a sheet of A3 or A4 format fed from a cassette 68. The image on the sheet is then fixed by a set of rollers 69. The sheet is echausted from the machine into a tray 70. The drum is cleaned up by a cleaner 71 for reuse. When a both side copy is desired, a pawl 101 is turned up on completing the copy on the first side of the sheet so that the fixed copy sheet is not exhausted from the machine but transported to an intermediate tray 100 for waiting. With the start of beam scan on the image of the next page, the sheet is sent out from the intermediate tray 100 in a determined timing to transfer the image of the next image onto the second side of the sheet from the drum. Until this time point, the pawl 101 is again turned down to its original position.

Hereinafter, the manner of control on a both side copying process will be described with reference to Figures 7 - 10. The flow shown in Figure 10 is executed by the image processor 15 shown in Figure 2.

As previously described, each page of a book 1 in size of A4 format is read and the read original is stored in the memory 5 as a data file (1), (2). After the above operation, discrimination is made as to whether or not the data store is completed or as to whether or not the start signal is issued (3). When "Yes", the first stored $A4_0$ page data is transferred to area M1 of the image memory 4 from the external sub-memory 5. Similarly, $A4_1$ page data is transferred to the next area M2 of the image memory 4. Among data in the image memory 4, data at M1 is at first sent out to the image printer 7 (4), (5) to print it on the top side surface of a copy paper of A4 format. The copy sheet carrying a print on its top surface is transported to the intermediate tray 100 where the copy sheet is turned inside out. The reversed sheet is again sent out from the intermediate tray 100 toward the transfer station. The image processor 15 discriminates whether the copy sheet is exhausted from the intermediate tray or not by means of a sheet sensor 102 (6). After confirming the sheet exhaust from the tray 100, data at M2 of the image memory 4 is transferred to the image printer (10), (11) to print it on the backside surface of the copy sheet. Thus, there is obtained a both side copied record as that of 2-2-(1)' in Figure 7. If no sheet exhaust from the intermediate tray 100 is detected, it is regarded as occurrence of a jam trouble (7) and copying operation is inhibited until a jam reset key is turned on (8). Upon resetting, output of data $A4_0$' is again started to repeat copy making on the top side of copy paper. At step 12 a discrimination is made as to whether or not the copy sheet already copied on the both sides is jammed, by means of a sheet sensor 103.

If no sheet is detected at the time when output of data at M2 is completed, then the step is turned toward jam routine J. After jam resetting, data output of $A4_0$' is again started to continue printing. When a sheet exhaust from outlet is detected, data of the next two pages are transferred from the file memory 5 to the image memory 4. In the same manner as above, pages $A4_2$ and $A4_3$ are copied to produce a record as that of 2-2-(2)' in Figure 7. The records (1)' and (2)' of 2-2 thus obtained are bound together at H as shown in Figure 8. When the bound records are opened wide, the image $A4_1$" is on the left-hand side and $A4_2$" is on the right-hand side. This arrangement of pages is entirely the same as that of the original 1-(2).

In this manner, a copy having the same page arrangement as that of the original can be obtained without need of folding work. Such copy is very easy to see. Many variations of the above embodiment are possible. In the above embodiment, at the first reading step, $A4_0$ page and $A4_5$ page of the book original 1-(1) have been read at once. After reading, the image data have been sent out from the image memory to the image printer while separating one page from the other page. However, it is also possible to carry out copying operation every reading and carry out page arrangement in synchronism with the operation of the intermediate tray. Further, it is possible to carry out printing on the first surface of a copy sheet in sychronism with reading while storing only one page data for the second surface thereof in the image memory 4.

CLAIMS

1. An image processing method comprising the steps of:
storing document image data in a memory;
operating input of character image data; and
processing any one of said character image data and document image data in such manner as to reproduce the other image in an area other than the area for reproducing one of said document image and character image.

2. An image processing method according to Claim 1 wherein said processing step determines the position of said character image depending on the position of said document image.

3. An image processing apparatus comprising:
a memory for storing document image data;
means for input of character image; and
means for processing data of any one of said document image and character image in such manner as to reproduce the other image in an area other than the area for reproducing the one image.

4. An image processing method comprising the steps of:
storing document image data in a first memory;
processing data stored in said first memory;
storing said processed image data in a second memory; and
carrying out print output depending on the image data stored in said second memory.

5. An image processing apparatus comprising:
first and second page memories for storing document image data; and
means for processing the data in said first memory so as to reproduce the image with rearrangement and storing said processed image data in said memory.

6. A copying method comprising the steps of:
reading document image data;
storing said read image data in a memory; and
putting out the image data in an amount of plural number of images serially so as to copy said plural number of images on one and same sheet.

7. A copying machine comprising:
means for reading document images;
means for storing the read image data; and
means for putting out image data in an amount of plural number of images serially so as to copy said plural number of images on one and same sheet.

8. An image forming apparatus comprising:
a memory for storing image data;
means for putting out image data in an amount of plural number of images serially; and
means for controlling said output means according to the feed of sheet so as to form an image in a determined position on said sheet.

9. An image forming apparatus comprising:
means for reading a document;
means for putting out a plural number of read data serially; and
an intermediate tray for refeeding a sheet so as to perform image formation on both sides of said sheet.

10. An image processing method substantially as hereinbefore described with reference to Figures 2 to 10 of the accompanying drawings.

11. An image processing apparatus substantially as hereinbefore described with reference to Figures 2 to 10 of the accompanying drawings.

12. A copying method substantially as hereinbefore described with reference to Figures 2 to 10 of the accompanying drawings.

13. A copying machine substantially as hereinbefore described with reference to Figures 2 to 10 of the accompanying drawings.

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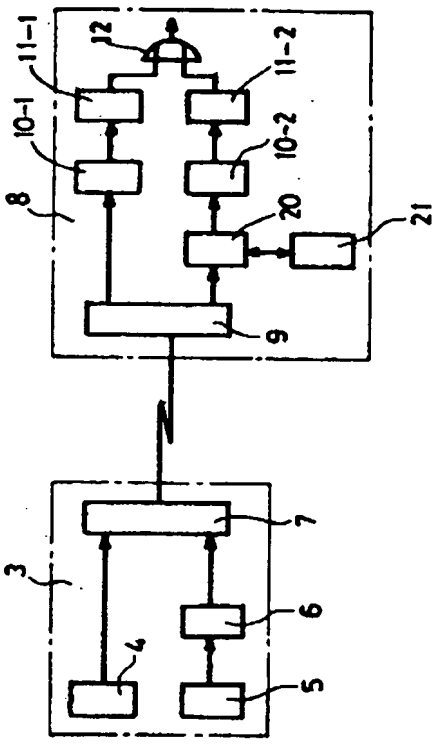

ABSTRACT : PURPOSE:To decrease the number of times of utilization of a communication circuit by providing a facsimile receiver with a pattern data storage circuit and a retrieving circuit, and extracting pattern data by received code information and then synthesizing it and image data.
CONSTITUTION:In a facsimile transmitter 3, only necessary information which is entered not in dropout color is read by an image data input circuit 5 and after data compression, it is transmitted together with code information inputted to a code input circuit 4. A facsimile receiver 8 stores image data in a buffer 10-1, and the data is expanded by a data expanding circuit 11-1. Simultaneously, code information is applied to a retrieving circuit 20 to read pattern data based on a code out of a storage circuit 21, and the read data is applied to an OR circuit 12 through a data buffer 10-2 and the data extending circuit 11-2. The OR circuit 12 synthetizes the image data and pattern data to generate an original.